

ABSTRACT

A charge trapping semiconductor device is ~~field-effect transistor (NDR—FET) device is disclosed~~ particularly suited as a replacement for conventional pull-up and load elements such as NDR diodes, passive resistors, and conventional FETs. The ~~NDR—FET device~~ includes a charge trapping layer formed at or extremely near to an interface between a substrate (which can be silicon or SOI) and a gate insulation layer. The charge trapping device can be shut off during static operations to further reduce power dissipation. ~~In this fashion, charge traps can be optimized for extremely rapid trapping and de-trapping of charge because they are extremely close to a channel of hot carriers.~~ The ~~NDR—FET is also useable as a replacement for conventional NDR diode and similar devices in memory cells, and enables an entire family of logic circuits that only require a single channel technology (i.e., instead of CMOS) and yet which provide low power.~~